TOPIC 2B – CELL MEMBRANES

Describe how lactose is formed & where in the cell it would be attracted to a polypeptide to form a glycoprotein (4marks)
*Lactose is produced through the condensation reaction of glucose & galactose, Joined through a glycosidic bond
*Would be attached to glycogen so it can release energy when hydrolysed
*Attached in the cell membrane in the fluid mosaic
*Added to polypeptide in golgi apparatus

Suggest and explain two ways the cell surface membranes of cells lining the uterus may be adapted to allow rapid transport of nutrients (2marks)
*Large surface area as membrane folded
*Large number of channel proteins for facilitated diffusion

Explain how the hydrophobic and hydrophilic properties of phospholipids help to maintain the structure of cell membranes. (6marks)
*Hydrophobic tail, hydrophilic head;
*Head made from glycerol and phosphate;
*Tail made from two fatty acids; saturated / unsaturated fatty acid (in tail);
*Phospholipids form a bilayer; stability to membrane brought about by attraction between hydrophobic tails / between hydrophilic heads and water;
*Phospholipid bilayer forms with heads in contact with water on both sides of membrane;
*Hydrophobic tails found in centre (of bilayer) away from water;
*Phospholipids allow for membrane fluidity / flexibility;
*Fluidity / flexibility helps membranes to be (functionally) stable;
*Phospholipids with short fatty acids / unsaturated fatty acids are more fluid;
*Fluidity is important in breaking and remaking membranes (eg endocytosis / exocytosis);

List the functions of membrane proteins. (6marks)
*Hormone binding sites;
*Enzymes;
*Electron carriers;
*Channels for (passive) transport;
*(pumps) for active transport;
*Cell to cell recognition;
*Receptors for neurotransmitters;

Describe the structure of the cell membrane (6 marks)
*A double layer of phospholipid molecules with head and tails;
*Hydrophilic, phosphate, polar heads and hydrophobic, hydrocarbon, non-polar tails;
*Intrinsic protein - passing completely through the lipid bilayer some with channels/pores;
*Extrinsic protein – only in one layer/surface;
*Molecules can move in membrane- dynamic, contains cholesterol
*Glycolipids- carbohydrates attached to lipid;
*Glycoprotein act as cell surface receptors for hormones & neurotransmitters;

Describe how the distribution of cell membranes in prokaryotic cells such as bacterium differs from that in a cell from a plant leaf (4marks)
*Absence of nuclear envelope,
*No membrane bounded organelles such as mitochondria/ chloroplast/ vacuole/ lysosome
*Membrane systems/ endoplasmic reticulum Golgi

Oxygen and chloride ions can diffuse across cell-surface membranes. The diffusion of chloride ions involves a membrane protein. The diffusion of oxygen does not involve a membrane protein. Explain why the diffusion of chloride ions involves a membrane protein and the diffusion of oxygen does not. (5 marks)
*Chloride ions water soluble/charged/polar;
*Cannot cross (lipid) bilayer (of membrane);
*Chloride ions transported by facilitated diffusion OR diffusion involving channel/carrier protein;
*Oxygen not charged/non-polar;
*(Oxygen) soluble in/can diffuse across (lipid) bilayer;

Explain why a plant will wilt if not watered? (6marks)
*Water enters plant cells by osmosis
*When a plant is well-watered, the cells are turgid
*When a plant isn't watered, it will lose water, as water will diffuse from the cells
*As water concentration is now lower outside the cell
*Cells will lose their turgidity
*The cell contents are no longer pushing against cell wall- the cell will become flaccid and the plant will wilt

Describe how you would use a 1 moldm-3 solution of sucrose to produce 30cm3 of 0.15moldm-3 solution of sucrose (2marks)
Add 4.5cm3 of 1.0moldm-3 solution to 25.5cm3 distilled water

Describe how you would use the students results in table 3 to find the water potential of the potato tissue (3marks)
*Plot the graph with concentration on x-axis and percentage change in mass on the y-axis
*Find concentration where curve crosses the x axis/% change is zero
*Use another resource to find water potential of sucrose concentration where curve crosses x-axis

Explain how amino acids are transported from the ileum to the blood (4marks)
*Sodium ions and amino acids absorbed by co-transport via carrier proteins
*Sodium ions were removed from epithelial cells by active transport into the blood
*Maintains low concentration of sodium ions between small intestines and epithelial cells
*Sodium enters epithelial cells by facilitated diffusion taking amino acids with them from SI
*Amino acids move by facilitated diffusion into blood from epithelial cells

The scientists concluded that the cells in flask g took up ions by active transport explain how the information given supports this conclusion (4marks)
*Negative gradient therefore doesn't go down concentration gradient
*Therefore requires energy so must be active transport
*Faster uptake in G due to ATP
*Sodium concentration goes to zero in flask G must be active transport or would reach an equilibrium

Explain how the structures of the walls of arteries and arterioles are related to their functions (6marks)
Elastic tissue
*Elastic tissue stretches under pressure / when heart beats then recoils / springs back;
*Evens out pressure / flow;
Muscle
*Muscle contracts to reduce diameter of lumen / vasoconstriction / constricts vessel;
*Changes flow / pressure;
Epithelium
*Epithelium smooth;
*Reduces friction / blood clots / less resistance;

Describe and explain ways in which the structure of a capillary adapts it for the exchange of substances between blood and the surrounding tissue (6marks)
*Permeable capillary wall / membrane;
*Single cell thick / thin walls, reduces diffusion distance;
*Flattened (endothelial) cells, reduces diffusion distance;
*Fenestrations, allows large molecules through;
*Small diameter / narrow, gives a large surface area to volume / short diffusion distance;
*Narrow lumen, reduces flow rate giving more time for diffusion;
*Red blood cells in contact with wall / pass singly, gives short diffusion distance / more time for diffusion;

Describe how tissue fluid is formed & how its returned to the circulatory system (6marks)
*High hydrostatic pressure forces water fluid out
*Large proteins remain in capillary
*Low water potential in capillary due to plasma proteins
*Water enters capillary by osmosis
*Lymph system returns tissue fluid to circulatory system

The cells of the heart need a constant supply of blood. If the coronary arteries providing that blood become narrowed or restricted, a person has a greater risk of suffering a heart attack. Describe how the coronary arteries can become narrowed and explain how this can lead to a heart attack. (6marks)
*Eating a diet high in saturated fat has been linked to high levels of cholesterol in the blood.
*If there is too much cholesterol in the blood it can start to build up in the coronary arteries. This causes plaques to form in the artery walls. Plaques narrow the arteries and restrict the flow of blood.
*The coronary arteries can become narrowed through the formation of plaques.
*Narrowed coronary arteries can lead to a heart attack. This is because blood flow to the heart is restricted and the heart muscle receives less oxygen.
*A thrombosis (blood clot) may further restrict or block blood flow.
*If the flow of blood to the heart is completely blocked, an area of the heart will be cut off from its oxygen supply. This can cause a heart attack.

Explain how nervous control in a human can cause increased cardiac output during exercise (4marks)
*Coordination via medulla of brain/ cardiac centre
*Increased impulses along sympathetic nerve
*To S.A. node/ pacemaker
*More impulses/ increased rate of discharge sent from S.A. node/ pacemaker

TOPIC 4A – DNA, RNA & PROTEIN SYNTHESIS

Messenger RNA (mRNA) is used during translation to form polypeptides. Decsribe how mRNA is produced in the nucleus of a cell (6marks)
*Helicase- breaks hydrogen bonds
*Only one DNA strand acts as a template
*RNA nucleotide attracted to exposed bases
*Attraction according to base pairing rule
*RNA polymerase joins RNA nucleotides together
*Pre-mRNA spliced to remove introns

How do the structures of mRNA and tRNA compare? (6marks)
*Has more nucleotides than tRNA;
*mRNA is a straight molecule but tRNA is a folded molecule/clover-leaf shaped molecule;
*mRNA contains no paired bases/hydrogen bonds;
*But tRNA has some paired bases/hydrogen bonds;

Starting with MRNA in nucleus of a cell, describe how a molecule of protein is synthesised (6marks)
*MRNA leaves nucleus through nuclear pore to ribosome
*TRNA molecules bring amino acid to ribosome
*Specific TRNA molecule for specific amino acid
*Anticodon of TRNA corresponds to complementary codon on MRNA
*Peptide bonds form between amino acids
*TRNA detaches & collects another amino acid, ribosome moves along MRNA

Describe what happens during translation (3marks)
*Codons on MRNA, anticodon on TRNA
*20 types of TRNA molecules
*Specific amino acid attaches to TRNA, peptide bond forms